Configuration of high-latitude and high-altitude boundary layers

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We have analyzed 1757 high-altitude, high-latitude cusp and boundary crossing and 2248 magnetopause crossing carried out through four years of Hawkeye spacecraft measurements during 1974-1978. This comprehensive sampling with plasma, magnetic field, and plasma wave data enables us to isolate the primary variables affecting the occurrence frequency and location of the cusp, plasma mantle, entry layer and high-latitude magnetopause regions [T. Eastman et al., 2000]. SM coordinates are found to best order the angular position of cusp region data intervals whereas GSM coordinates are better for ordering in radial distance, especially for the plasma mantle. Dipole tilt and external pressure are the primary variables affecting high-latitude and high-altitude boundary configuration. For high-altitude cusp measurements, dipole tilt and external pressure corrections are critical to assessing IMF effects. As the dipole tilts more towards the oncoming magnetosheath plasma flow, indentation becomes enlarged and the cusp outflow region, the plasma mantle, becomes more flared out relative to the Earth-Sun line. In contrast, as the dipole tilts away from the Sun direction, cusp indentation is reduced but the cusp outflow region remains flared out compared to boundary shapes inferred from low-latitude observations. The semiempirical magnetopause model by Boardsen et al.. [2000] compares very well with the high-latitude boundary layer observations reported here including a test for hemispheric symmetry, which is assumed by the model.

References: T. E. Eastman, S. A. Boardsen, S.-H. Chen, S. F. Fung, and R. L. Kessel, Configuration of high-latitude and high-altitude boundary layers, J. Geophys. Res., 105, 23221-23228, Oct. 1, 2000.

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